1998 Status & Condition

Of the Arizona Highway System

- ❑ Average Daily Traffic Volume
- ❑ Percent Commercial Vehicles
- ❑ Bicycle Suitability
- ❑ Functional Classification
- ❑ Levels of Development
- ❑ Levels of Service
- ❑ Present Serviceability Ratings

Prepared by the
Transportation Planning Division

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Introduction

The 1998 Arizona State Highway System Status and Condition Report is the first effort by the Arizona Department of Transportation's Transportation Planning Group to present information, that is typically used by transportation professionals, in a graphic format to both a professional and lay audience. In the past, reports of this type consisted of numerous tables, with a vast amount of numbers. They also consisted of graphs, charts and a few maps.

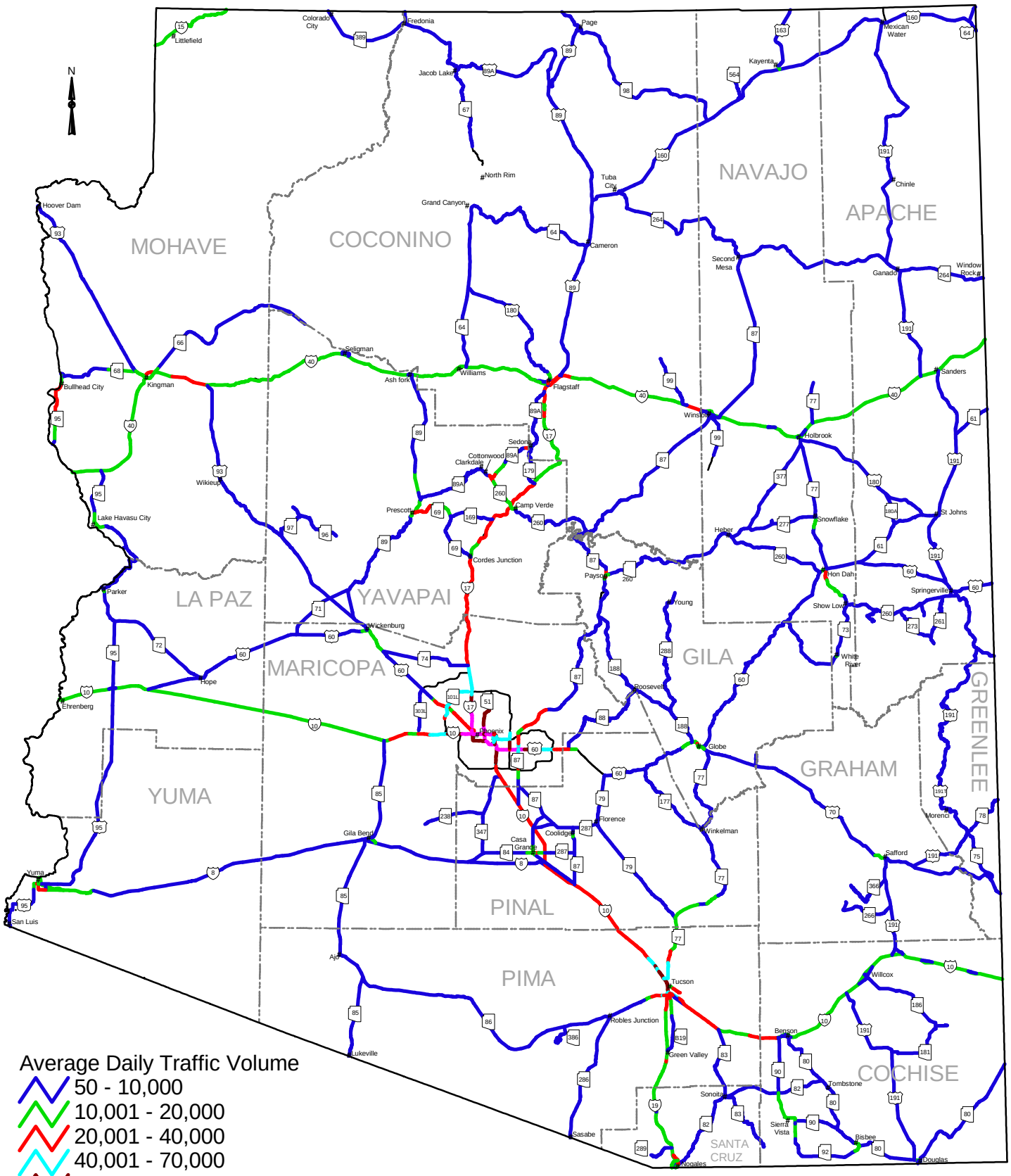
The Arizona State highway system route and lane mileages are 6,142 and 15,895 respectively. There are 4,169 bridges on the system. The data that is used to develop various performance measures are collected throughout the year and are stored in individual databases. These databases are integrated in the Highway Performance Monitoring System (HPMS) database. The HPMS database is then incorporated into the ADOT Geographical Information System (GIS).

The GIS is a powerful tool that is used for analysis and mapping. The GIS was used for all the maps in this report with the exception of the Bicycle Suitability Map. Maps of the state highway system following this introduction show the 1996 Annual Average Daily Traffic (AADT) volumes and the percent of commercial vehicles in the traffic stream. Following these maps is the Bicycle Suitability Map and a brief overview of its development

The data to develop the maps for Level of Service (LOS) and Present Serviceability Rating (PSR) was collected in 1996. It is the latest available. The functional classification of the state highway system was updated in 1997, as was the level of development.

As stated above this is the first effort to present this much and kind of information in a graphic format. It is the first of what is planned to be an annual report.

1996 Average Daily Traffic Volume on the State Highway System



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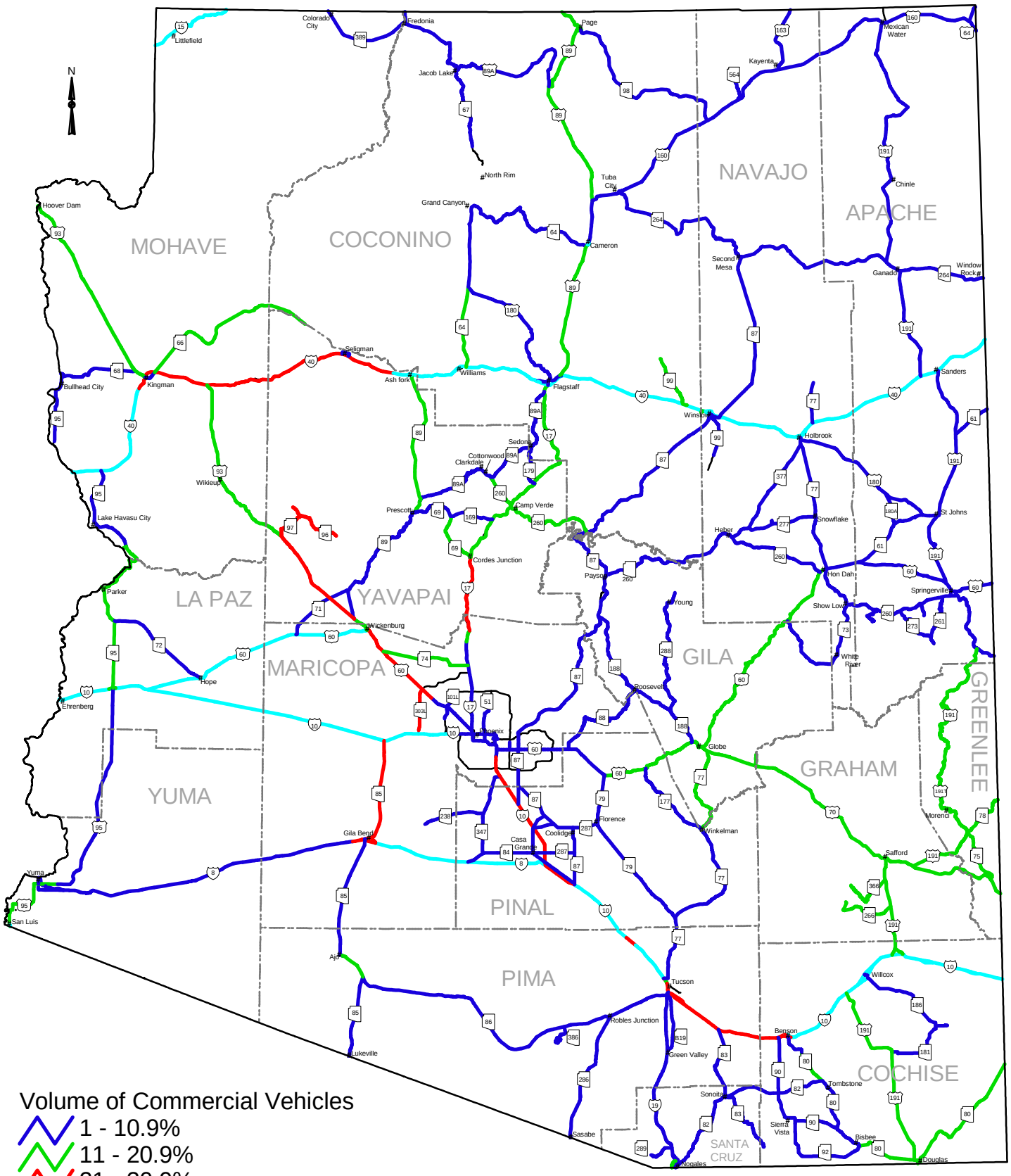
1996 Percentage of Commercial Vehicles on the State Highway System



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Bicycle Route Suitability

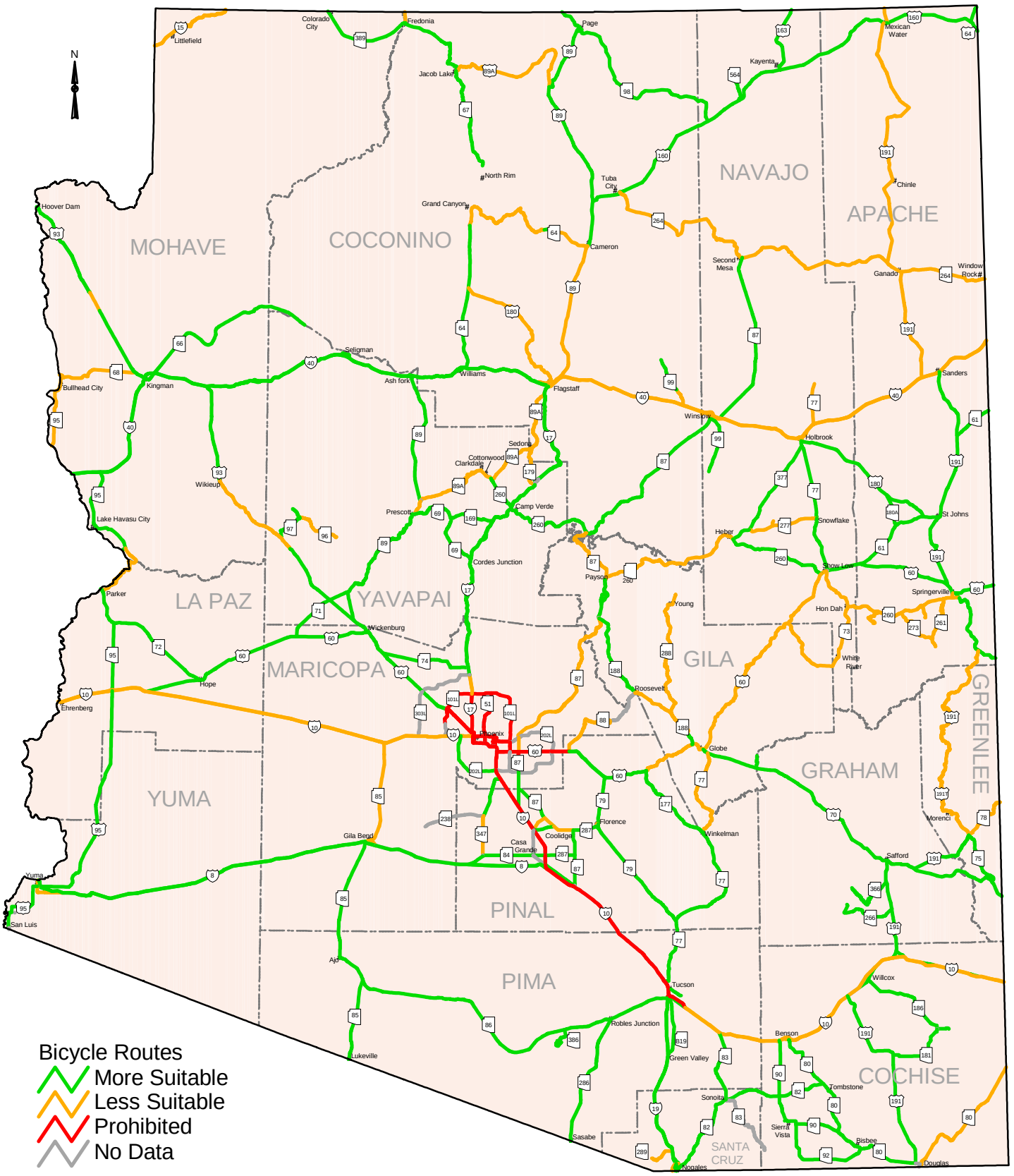
The Arizona Bicycle Route Suitability Map developed by ADOT contains suitability ratings and gradient information of roadways on the State Highway System. Bicycle route suitability ratings of "more suitable" and "less suitable" have been assigned to all roads on the State Highway system where bicycling is allowed. These ratings were assigned by the Governor's Arizona Bicycle Task Force (GABTF). The GABTF selected three variables as potential indicators of bicycle route suitability. These factors are:

1) Traffic Volume
   Average number of cars per day per lane
2) Lane Width
   Center line to outside of paved surface, including shoulder
3) Percent Commercial
   Percentage of commercial vehicles (truck traffic) to total traffic volume

These factors were combined to classify a road as "less suitable" or "more suitable" with the lane width factor having twice the significance as the others. In several cases, revisions were made to determinations of suitability by highly experience cyclists familiar with those areas. Information regarding grade ascent has also been provided to bicyclists to identify steep inclines along routes as an aid in planning tours.

Approximately 47% of the classified routes have a suitability rating of "more suitable." Prohibited portions of urban freeways are classified according to Arizona Department of Transportation (ADOT) administrative regulation.

Map of Suitable Bicycle Routes on the State Highway System



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Functional Classification

The 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) required each state to functionally reclassify its public roads and streets. The initial step in this process was to update the urban area boundaries by the middle of 1992. Extensive coordination and cooperation was essential throughout the updating of urban boundaries and the functional reclassification. ADOT worked with Colorado, New Mexico, Utah, and California to assure continuity of functional classification across state lines. The Phoenix, Tucson, and Yuma Metropolitan Planning Organizations (MPOs) were fully involved in this process. ADOT worked closely with the MPOs to ensure continuity at the urban boundaries and provide assistance as needed. The rural Councils Of Governments (COGs) were consulted to provide input on functional reclassification within their regions. ADOT and the COGs coordinated with the Native American Tribes to reclassify roads on their reservations. The Bureau of Indian affairs provided considerable assistance in this process. ADOT coordinated with the U.S. Forest Service and the National Park Service, including officials at regional offices and individual parks and forests. Close coordination with the Federal Highway Administration (FHWA) continued throughout the process. The functional reclassification of Arizona's public roadways was completed in December 1992. Arizona's submittal was reviewed and approved by the FHWA and the Secretary of Transportation and reported to Congress in 1993.

All roads that are part of the public road system are to be functionally classified as an integral system regardless of jurisdictional control of these roads. In other words, state highways, county roads, city streets, Forest Service roads, BIA roads, etc. are all part of the public road system. The classification process does not consider administrative or jurisdictional systems. The only way roads are separated into different classification systems is by their geographic location in rural, small urban, or urban areas.

The FHWA's document titled ***Highway Functional Classification: Concepts, Criteria, and Procedures*** (revised March 1989) was the principal reference for reclassification. ADOT employed the procedures required in this document. While differences exist between the procedures for rural, small urban and urban area classification, all used a 'top down' approach. As generally depicted on the following page, this approach delineates the highest functionally classified roadways first and then works progressively down the hierarchy of functional systems to conclude with the classification of local roads and streets. ADOT started this 'top down' approach by identifying the most important internal and external traffic generators for Arizona. The procedure enabled ADOT to functionally classify the State Highway System and share that information to facilitate efforts by the MPOs and COGs. Arizona based the functional reclassification on current use, not projected use.

Due to the differences in the criteria used to functionally classify roads in rural, small urban, and urban areas it is simpler to categorize them as rural and urban for discussion purposes.

Rural Principal Arterials All rural interstate mileage is in this category. They are the principal corridors of interstate travel. There are relatively few corridors used by most travelers going to and from adjacent states or Mexico. Principal arterials serve the highest volume long distance trips. The non interstate routes identified as principal arterials serve the same basic purposes as the interstates, but at lower volumes and speeds.

Rural Minor Arterials These roads serve most of the larger communities not served by the principal arterial system. They provide interstate and intercounty service. The trip length and travel density is larger than on the collector systems. Travel is at relatively high speed with minimal interference to through movement.

Rural Major Collectors The travel on these roads is of intracounty and regional importance, rather than statewide importance. These roads provide service to any county seat not on an

arterial road. They also serve larger communities not directly served by the higher systems. Rural major collectors usually connect to rural arterials.

Rural Minor Collectors These roads typically collect traffic from local roads and feed it onto major collectors or arterials. They tend to have lower traffic volumes then major collectors. If a minor collector carries a similar volume as a major collector trip distances are shorter. Also, they carry traffic on trips to less important traffic generators or they are parallel to a route of a higher classification.

Urban Principal Arterials There are three types of urban principal arterials: interstate, other freeways and expressways, and others with little or no access control. The primary function of these roads is to provide the greatest mobility for through movement, any direct access to adjacent land is purely incidental. This system serves the highest volume traffic generators and trips of longer length. They have a high proportion of urban area travel on a minimum of mileage.

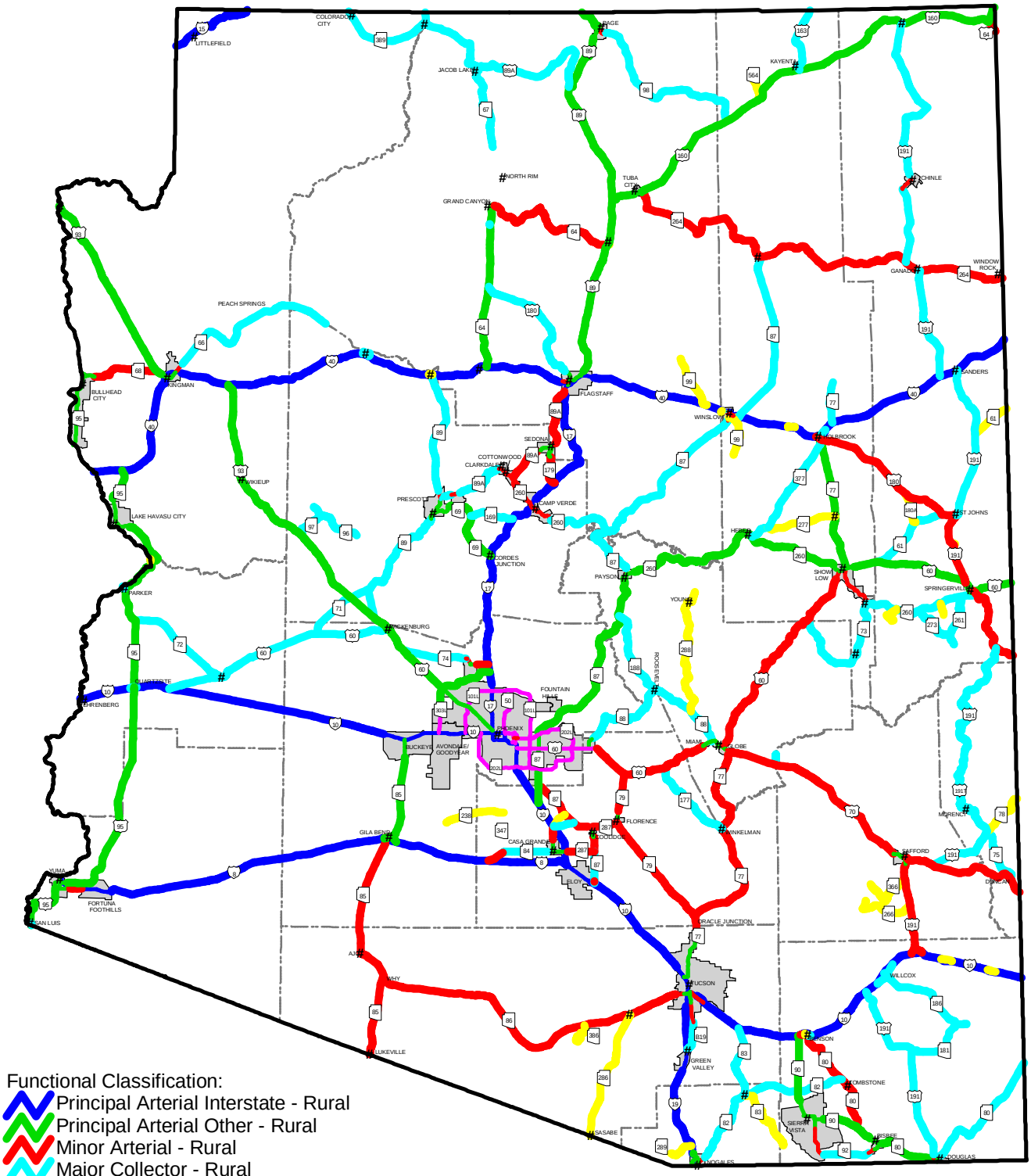
Urban Minor Arterials These roads provide trips of moderate length and trips of lower travel mobility than urban principal arterials. Consequently the speed limit is lower than on urban principal arterials.

Urban Collectors These roads distribute traffic from arterials and funnel traffic from local streets onto the arterial system. Frontage roads are classified independently of the controlled access facility they abut and are classified as collectors on the State Highway System.

Local Roads Local roads in both urban and rural areas are a residual. There are no roads on the State Highway System that are functionally classified as local roads.

The following map shows the current FHWA approved functional classification of the State Highway System.

1997 Functional Classification



Functional Classification:

- Principal Arterial Interstate - Rural
- Principal Arterial Other - Rural
- Minor Arterial - Rural
- Major Collector - Rural
- Minor Collector - Rural
- Principal Arterial Interstate - Urban
- Principal Arterial Expressway - Urban
- Principal Arterial Other - Urban
- Minor Arterial - Urban
- Collector - Urban

Urban Area

N

0 25 50 75 100

Miles

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Level Of Development

Central to the ADOT assessment of State Highway System needs is the notion of Level Of Development (LOD), a planning tool introduced as an integrative concept in the State Highway System Plan. LOD provides a hierarchical ordering of System routes into five categories in terms of the relative importance of routes to the System as a whole. The assignment to a LOD category takes into account the route's functional classification, level of significance, current and future daily traffic, current and future truck traffic, and other unique route characteristics (e.g., recreational use). The LODs are described briefly below, followed by a description of the role that the LOD concept plays in the assessment of System needs.

Level of Development 1: Interstate and urban controlled access facilities form the backbone of the system. Among many functions served, LOD 1 routes provide the principal means of interstate travel, serve the greatest volume of traffic, link the state's metropolitan areas, and provide the major truck routes. These routes are built and maintained to the highest standards.

Level of Development 2: In terms of both use and function, LOD 2 routes are the most important non-controlled access routes statewide. For the most part, these routes were constructed as two lane rural highways designed to accommodate relatively low traffic volumes. With continuing growth, new demands are being placed on these highways to accommodate increased automobile and truck traffic. Hence, these routes are prime candidates for major reconstruction projects to provide the additional capacity to maintain both highway safety and performance.

Level of Development 3: Routes without unique travel or service characteristics comprise the LOD 3 category. These are mainly two lane rural routes which may be expanded to four lanes in urban areas. Most of the routes on the System are in this category.

Level of Development 4: Highways bearing low traffic volumes and serving primarily as feeder routes with local significance compose the LOD 4 category.

Level of Development 5: The last category in the hierarchy is comprised of routes which no longer serve a state level service role, together with routes that have never been built. Thus, LOD 5 routes are prime candidates to transfer from the state system.

The following map depicts all state highways and the LOD to which they have been assigned. Note that over 90% of the total mileage is in rural areas, and that the LOD 2 network is much smaller than either the LOD 1 or 3 systems. It is apparent that LOD 3 routes comprise by far the largest category, especially on the rural system.

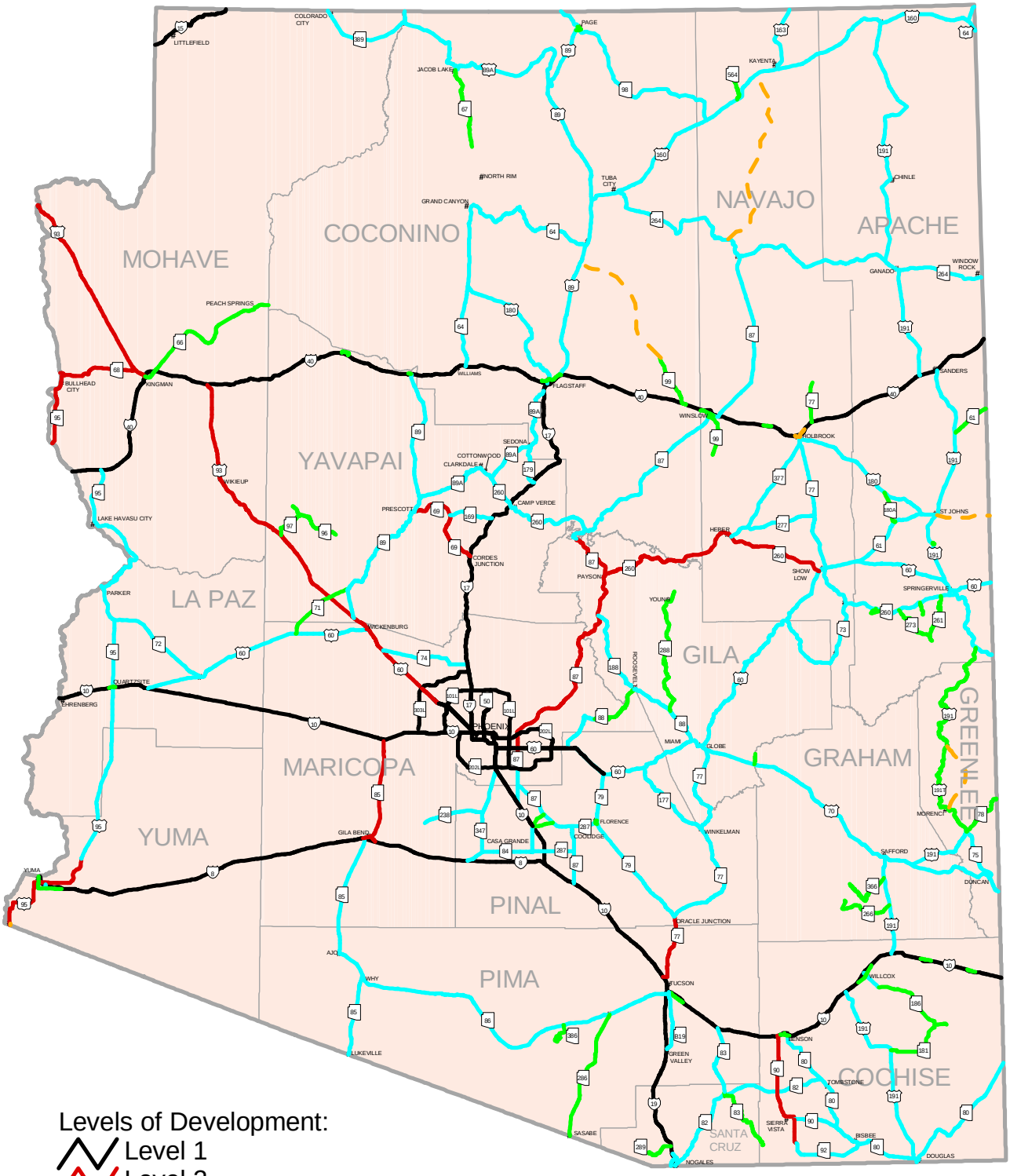
Stability of Route Assignments to Levels of Development

Because the assignment of a highway to a particular LOD is based on a set of standards, a highway may be reassigned to another LOD when the function or use of that highway changes. However, given the nature of the standards and current projections of population growth and travel in Arizona, such changes are likely to occur infrequently. It was assumed that the functions served by individual routes will not change sufficiently in the coming decade to warrant reassignment to another LOD.

Value of the Level of Development Concept

Much of the utility of the LOD concept lies in making explicit important differences among system components. The hierarchy of routes points out the fact the System is not homogeneous; rather it is comprised of interrelated parts which vary considerably in terms of functions served. LOD, then, may be viewed as a categorical system which summarizes certain critical differences among routes. Differences which have implications for a variety of administrative, operational, and investment decisions. For example, recognition of such differences is important in defining appropriate construction or reconstruction projects. It is important in establishing priorities among routes competing for limited funds.

1997 Levels of Highway Development



Note: Dashed lines are survey routes

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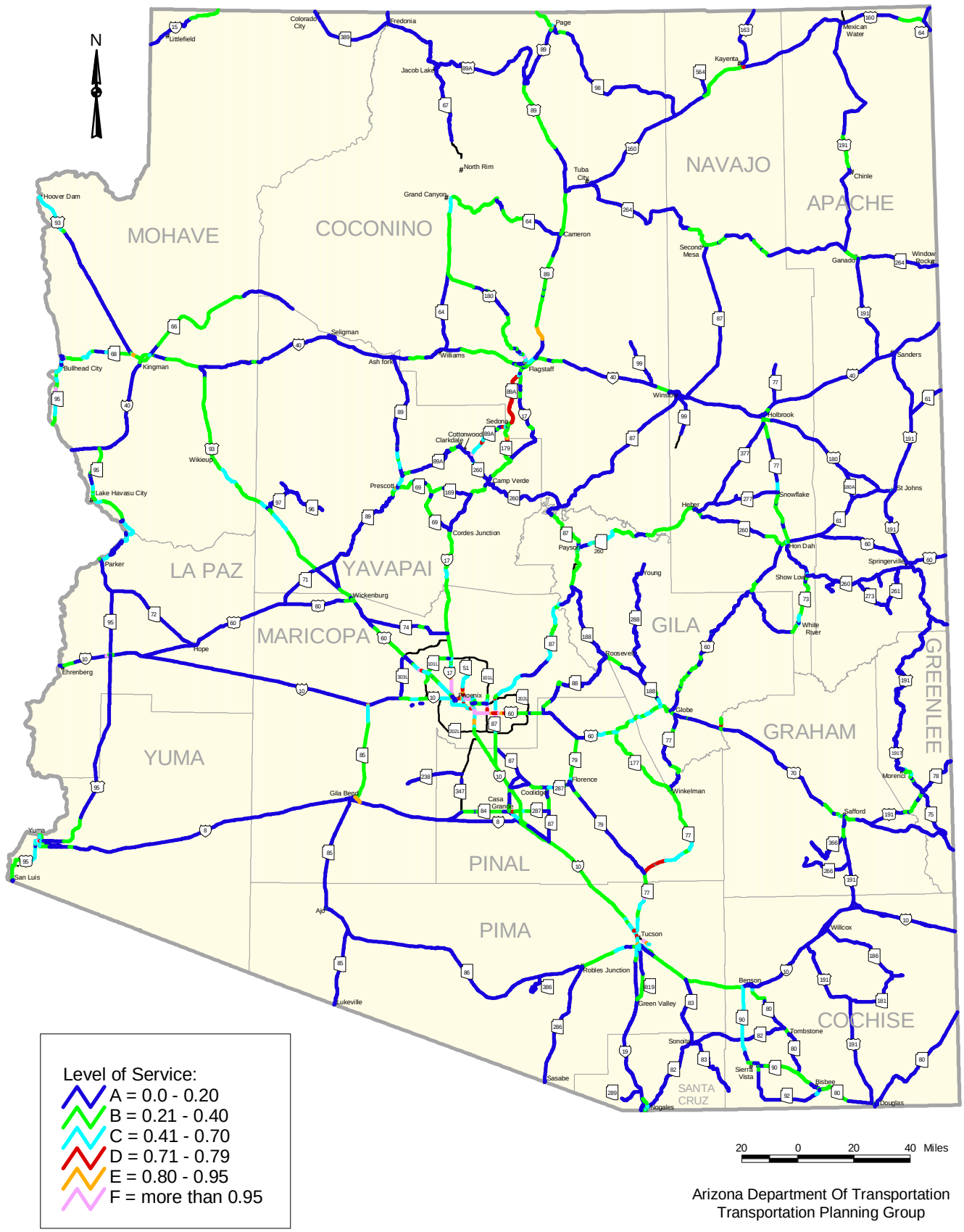
Level of Service

The Level Of Service (LOS) is derived from the range of values of the volume/ capacity ratio (v/c). The v/c ratio is the ratio of demand flow rate (volume) to capacity for a traffic facility. The volume is the number of vehicles passing a point on a lane, roadway, or other trafficway during some time interval expressed in vehicles. The time interval used in developing the v/c ratios used in this report is equal to a day. The vehicles are expressed in Annual Average Daily Traffic (AADT). The capacity is the maximum rate of flow at which vehicles can reasonably be expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic, and control conditions. Capacity is also expressed as AADT. The LOS is a qualitative measure describing operational conditions within a traffic stream generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. The v/c ratios, the LOS and the the conditions they indicate are as follows:

V/C Ratio	LOS	Condition
0 - 0.20	A	Free flow
0.21 - 0.40	B	Free Flow with maneuverability slightly impeded
0.41 - 0.70	C	Stable flow maneuverabilty noticeably restricted
0.71 - 0.79	D	Stable flow, reduced speed maneuverabilty limited
0.80 - 0.95	E	Near capacity, speeds are low but relatively uniform
>0.96	F	Volume at or near capacity, speeds are significantly reduced.

1996 Level of Service
on the State Highway System



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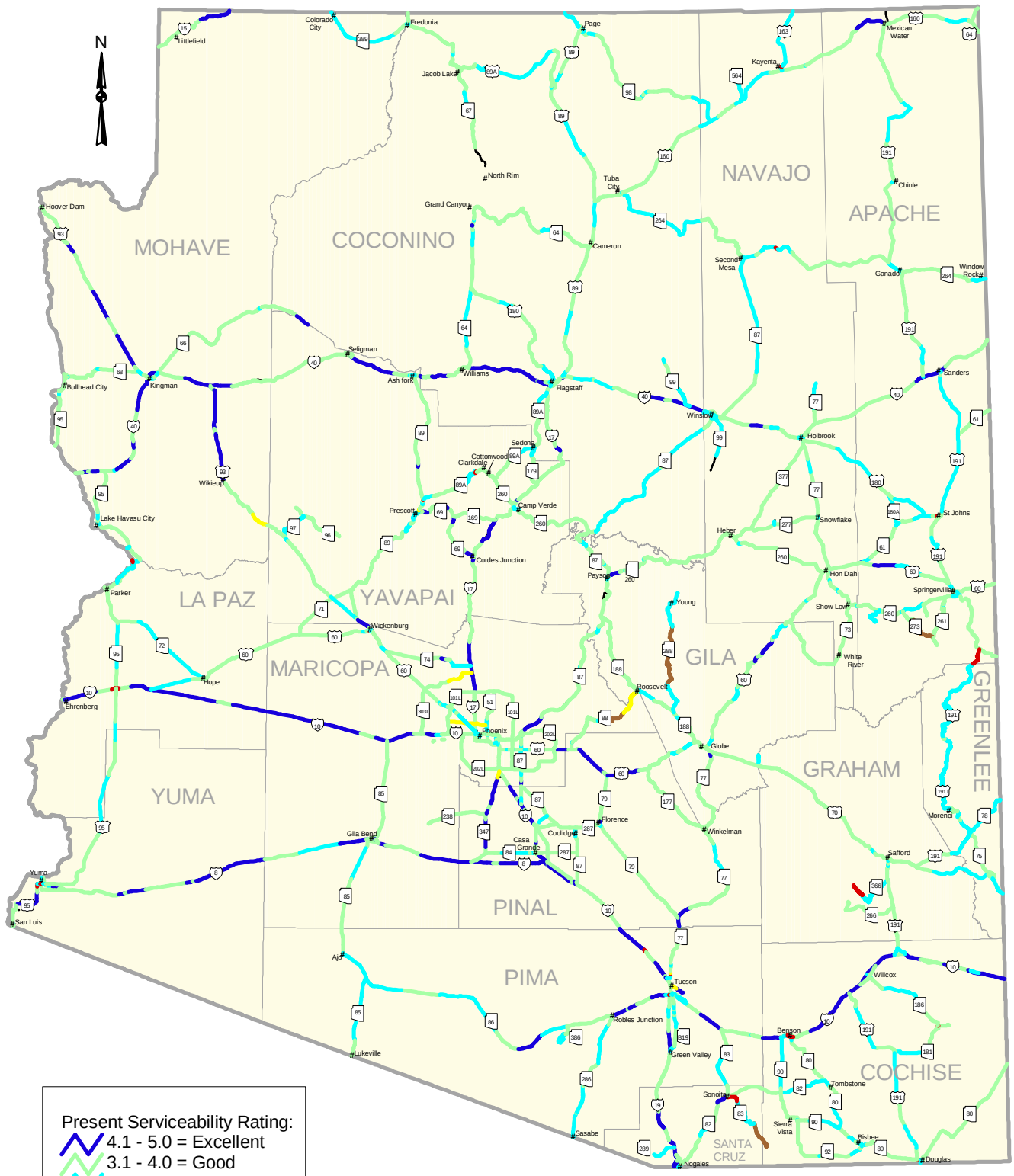
Present Serviceabilty Rating

The Present Serviceabilty Rating (PSR) is derived from readings taken by a mechanical device that measures deviations in the roadway surface. The deviations provide a measure of the smoothness or roughness of the pavement. The PSR rates the pavement condition on a scale from 0 to 5, with 0 being very poor (undriveable) and 5 being excellent (new surface). The pavement rating ranges and the conditions they indicate are as follows:

PSR	Condition	Indication
0 - 1.0	Very Poor	Extremely deteriorated
1.1-2.0	Poor	Has large pot holes,cracking,distress
2.1-3.0	Moderate	Barely tolerable for high speed traffic
3.1-4.0	Good	Relatively Smooth
4.1-5.0	Excellent	New or superior

1996 Road Conditions
on the State Highway System



Present Serviceability Rating:
- 4.1 - 5.0 = Excellent
- 3.1 - 4.0 = Good
- 2.1 - 3.0 = Moderate
- 1.1 - 2.0 = Poor
- 0 - 1.0 = Very Poor
- unpaved

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